

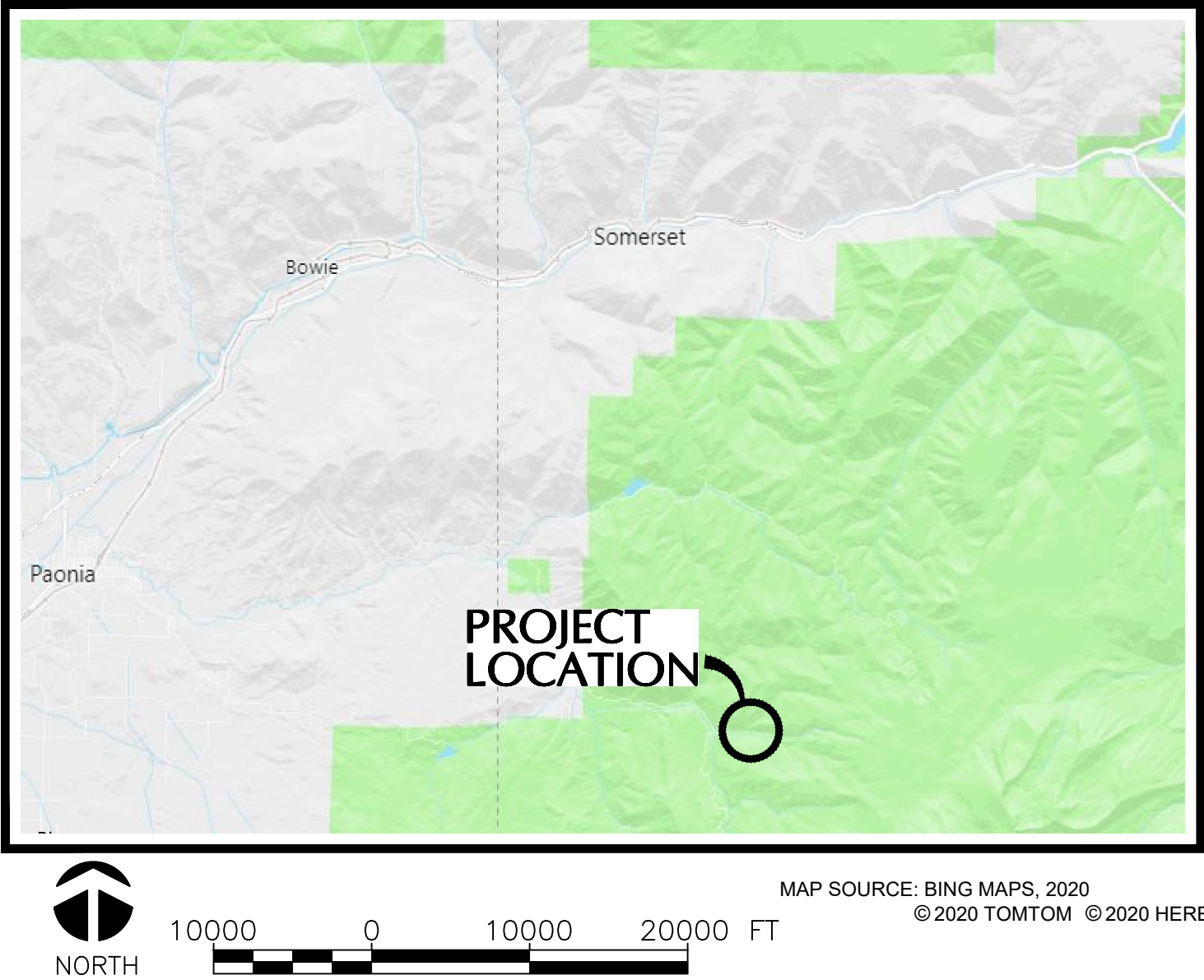
SOUTH PRONG STREAM RESTORATION PLAN

MOUNTAIN COAL COMPANY, LLC WEST ELK MINE

GENERAL NOTES

1. THE SOUTH PRONG STREAM RESTORATION PLAN PROVIDES INFORMATION REGARDING THE APPROACH TO RESTORE THE STREAM CORRIDOR OF SOUTH PRONG CREEK AND THE NORTH FORK OF SOUTH PRONG CREEK TO ITS HISTORICAL CONDITION. PRIOR TO THE SUBSIDENCE WITHIN THE PROJECT AREA. THE PLAN INCLUDES TYPICAL STREAM DIMENSION, ALIGNMENT, PROFILE, SUBSTRATE MATERIAL, AND REVEGETATION PLAN TO RE-ESTABLISH BOTH SOUTH PRONG AND THE NORTH FORK OF SOUTH PRONG CREEK TO THEIR NATURAL STATE. THE RESTORATION PLAN HAS BEEN DEVELOPED FROM THE UNDISTURBED AND STABLE UP- AND DOWNSTREAM REACHES FROM THE PROJECT AREA. THE PLAN WILL TIE INTO THE STABLE AND UNDISTURBED STREAM UP- AND DOWNSTREAM OF THE PROJECT.
2. CONSTRUCTION OF THE STREAM RESTORATION PLAN SHALL BE DONE ONLY IN THE PRESENCE OF THE ENGINEER. THE PLAN PROVIDES THE OVERALL RESTORATION APPROACH, HOWEVER SOME 'FIELD FITTING' IS EXPECTED TO BE REQUIRED TO MAINTAIN CONTINUITY BETWEEN THE REACHES UP AND DOWNSTREAM OF THE PROJECT AREA. THE CONTRACTOR IS REQUIRED TO HAVE A SET OF THESE PLANS ON-SITE AT ALL TIMES.
3. HYDROLOGIC DATA USED TO INFORM THE STREAM RESTORATION DESIGN HAD BEEN COLLECTED FROM A NEARBY GAGE STATION ALONG SOUTH PRONG CREEK. THIS GAGE COLLECTED SEASONAL RUNOFF DATA FROM 2018 TO 2020. THIS DATA, IN CONJUNCTION WITH FIELD SURVEY AND HYDRAULIC COMPUTATIONS, WAS USED TO DEVELOP THE DESIGN LOW FLOW AND BANKFULL FLOW RATES, 1 CFS AND 13 CFS FOR SOUTH PRONG CREEK, AND 0.5 CFS AND 3 CFS FOR THE NORTH FORK OF SOUTH PRONG CREEK, RESPECTIVELY.
4. A GEOMORPHIC ASSESSMENT OF THE UP-AND DOWNSTREAM REACHES WAS COMPLETED. THE REACH OF SOUTH PRONG CREEK UPSTREAM OF THE PROJECT AREA WAS FOUND TO BE CONTROLLED BY BEDROCK AND THEREFORE THE DOWNSTREAM REACH DIMENSION WAS USED IN DEVELOPING THE RESTORATION PLAN. THE REACH OF SOUTH PRONG CREEK DOWNSTREAM OF THE PROJECT AREA WAS FOUND TO BE MODERATELY ENTRENCHED, HAVE A RELATIVELY STEEP SLOPE, AND CONSIST PREDOMINANTLY OF GRAVEL SUBSTRATE WITH SOME INTERMITTENT LARGER MATERIAL. THESE STREAM CHARACTERISTICS ARE CONSISTENT WITH THOSE OF A ROSGEN TYPE B4 STREAM TYPE. THE CHANNEL DIMENSION AND LAYOUT SHOWN IN THIS PLAN IS REPRESENTATIVE OF THIS STREAM TYPE AND HAS BEEN DEVELOPED FROM SURVEYED DATA OF THE DOWNSTREAM REACH.
5. THE PLAN INCLUDES REVEGETATION OF THE STREAM BANKS AND THE UPLAND AREAS WITHIN THE LIMITS OF DISTURBANCE TO RE-ESTABLISH THE HISTORICAL SITE CONDITIONS AND PROVIDE ECOLOGICAL BENEFIT.
6. THE PROJECT AREA IS CONTAINED ENTIRELY ON THE PROPERTY OWNED BY MOUNTAIN COAL COMPANY, LLC.
7. THE WEST ELK MINE WILL OBTAIN ALL REQUIRED PERMITS FOR THIS WORK.
8. THE EXISTING TOPOGRAPHIC SURVEY INCLUDED IN THIS RESTORATION PLAN WAS PROVIDED BY AECOM (TEL. 970-384-4731) ON OCTOBER 23, 2020. THE EXISTING TOPOGRAPHY REFLECTS THE CONDITION OF THE SITE AFTER THE SUBSIDENCE AREA HAD BEEN FILLED. CONTACT THE SURVEYOR FOR PROJECT BENCHMARK AND BASIS OF BEARINGS.

PROJECT LOCATION



CONTACTS

OWNER:
MOUNTAIN COAL COMPANY, LLC
WEST ELK MINE
5174 HIGHWAY 133
SOMERSET, CO 81434

CONTACT: KATHY WELT
970-929-2238 (OFFICE)

JESSICA WILCZEK, P.E.
970-929-2308 (OFFICE)

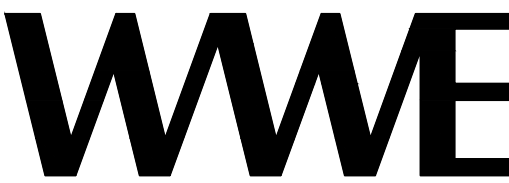
ENGINEER:
WRIGHT WATER ENGINEERS, INC.
818 COLORADO AVENUE
SUITE 307
GLENWOOD SPRINGS, CO 81602

CONTACT: DRAKE LUDWIG, P.E.
970-945-7755 (OFFICE)

SHEET INDEX

TS01	TITLE SHEET
HZ01	HORIZONTAL CONTROL AND GRADING PLAN
PP01	SOUTH PRONG CREEK PLAN & PROFILE
PP02	NORTH FORK OF SOUTH PRONG CREEK PLAN & PROFILE
DT01	TYPICAL SECTION
DT02	SECTION DIMENSIONS
DT03	REVEGETATION DETAILS

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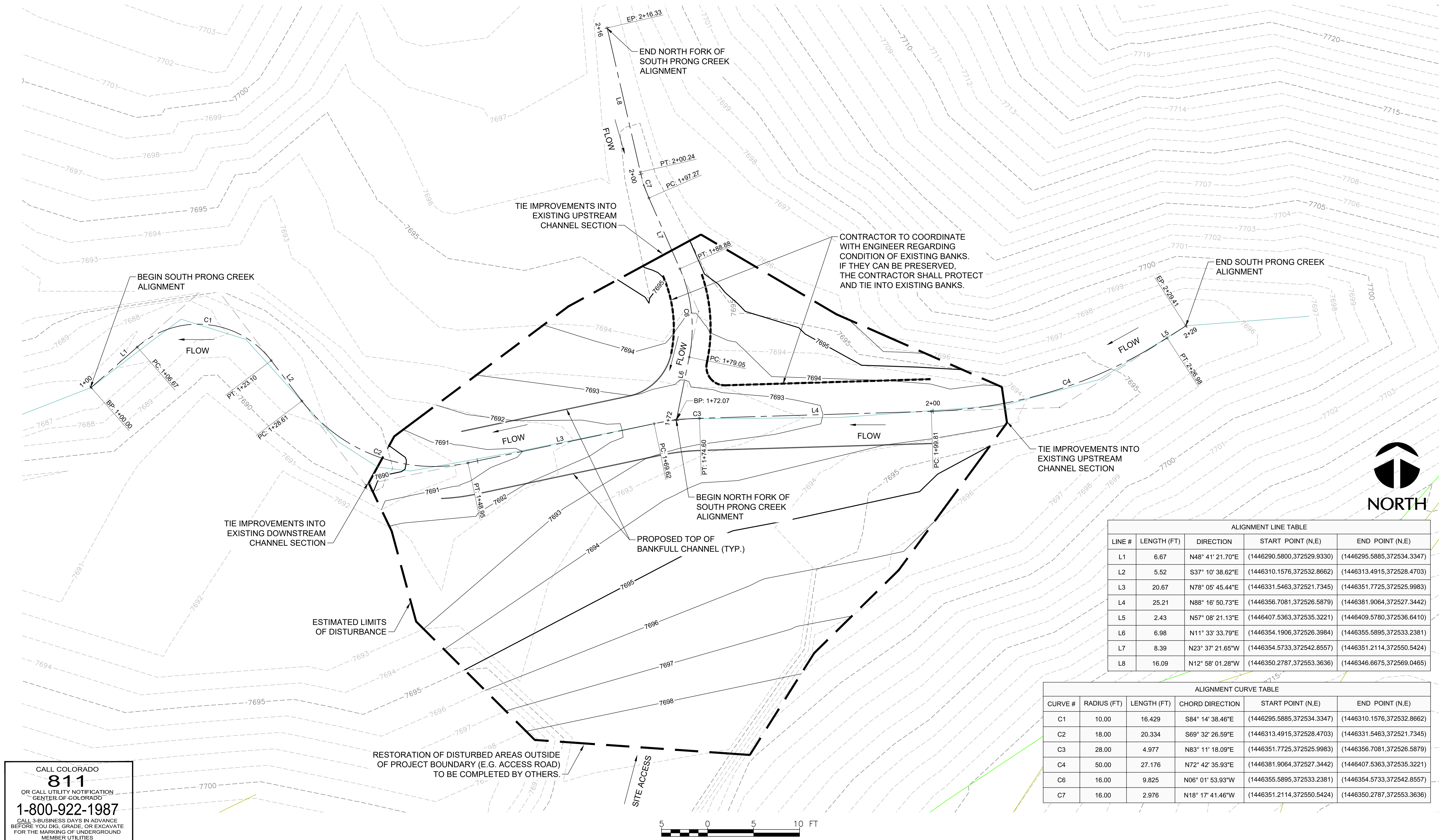
SOUTH PRONG STREAM RESTORATION PLAN

TITLE SHEET

JOB NO.
831-032.921
REVISION NO.

SHEET NO.
TS01

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ALIGNMENT LINE TABLE				
LINE #	LENGTH (FT)	DIRECTION	START POINT (N,E)	END POINT (N,E)
L1	6.67	N48° 41' 21.70"E	(1446290.5800,372529.9330)	(1446295.5885,372534.3347)
L2	5.52	S37° 10' 38.62"E	(1446310.1576,372532.8662)	(1446313.4915,372528.4703)
L3	20.67	N78° 05' 45.44"E	(1446331.5463,372521.7345)	(1446351.7725,372525.9983)
L4	25.21	N88° 16' 50.73"E	(1446356.7081,372526.5879)	(1446381.9064,372527.3442)
L5	2.43	N57° 08' 21.13"E	(1446407.5363,372535.3221)	(1446409.5780,372536.6410)
L6	6.98	N11° 33' 33.79"E	(1446354.1906,372526.3984)	(1446355.5895,372533.2381)
L7	8.39	N23° 37' 21.65"W	(1446354.5733,372542.8557)	(1446351.2114,372550.5424)
L8	16.09	N12° 58' 01.28"W	(1446350.2787,372553.3636)	(1446346.6675,372569.0465)

ALIGNMENT CURVE TABLE					
CURVE #	RADIUS (FT)	LENGTH (FT)	CHORD DIRECTION	START POINT (N,E)	END POINT (N,E)
C1	10.00	16.429	S84° 14' 38.46"E	(1446295.5885,372534.3347)	(1446310.1576,372532.8662)
C2	18.00	20.334	S69° 32' 26.59"E	(1446313.4915,372528.4703)	(1446331.5463,372521.7345)
C3	28.00	4.977	N83° 11' 18.09"E	(1446351.7725,372525.9983)	(1446356.7081,372526.5879)
C4	50.00	27.176	N72° 42' 35.93"E	(1446381.9064,372527.3442)	(1446407.5363,372535.3221)
C6	16.00	9.825	N06° 01' 53.93"W	(1446355.5895,372533.2381)	(1446354.5733,372542.8557)
C7	16.00	2.976	N18° 17' 41.46"W	(1446351.2114,372550.5424)	(1446350.2787,372553.3636)



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SOUTH PRONG STREAM RESTORATION PLAN

HORIZONTAL CONTROL AND GRADING PLAN

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SHEET NO.	HZ01

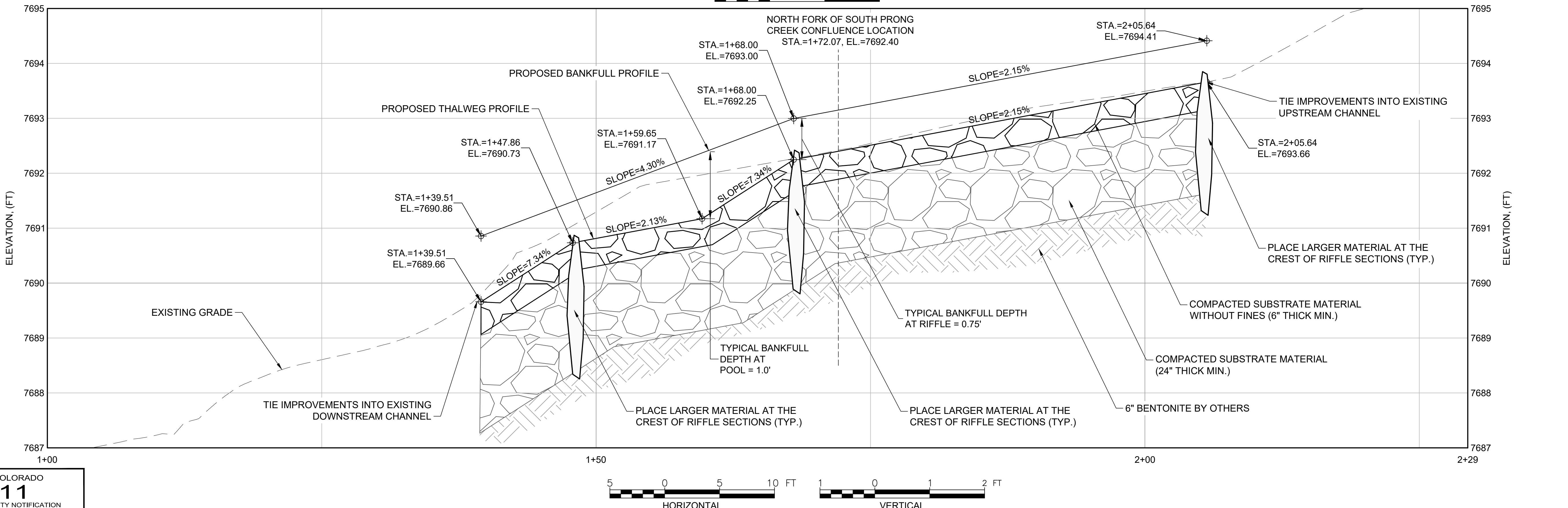
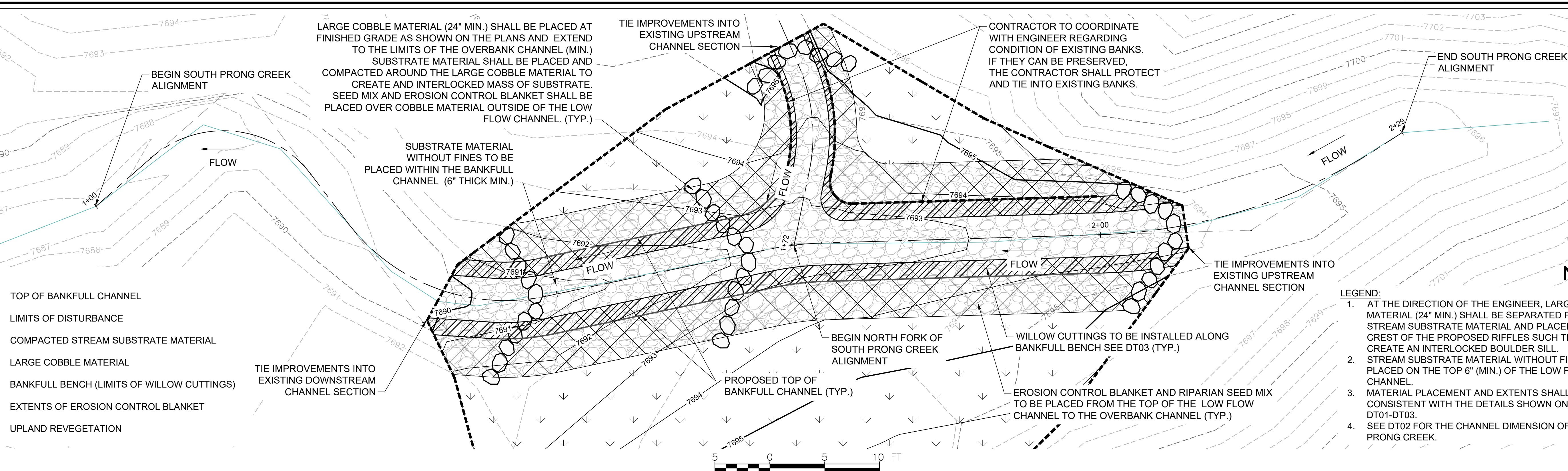
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LEGEND:

- TOP OF BANKFULL CHANNEL
- LIMITS OF DISTURBANCE
- COMPACTED STREAM SUBSTRATE MATERIAL
- LARGE COBBLE MATERIAL
- BANKFULL BENCH (LIMITS OF WILLOW CUTTINGS)
- EXTENTS OF EROSION CONTROL BLANKET
- UPLAND REVEGETATION

LEGEND:

- AT THE DIRECTION OF THE ENGINEER, LARGER COBBLE MATERIAL (24" MIN.) SHALL BE SEPARATED FROM THE STREAM SUBSTRATE MATERIAL AND PLACED AT THE CREST OF THE PROPOSED RIFFLES SUCH THAT THEY CREATE AN INTERLOCKED BOULDER SILL.
- STREAM SUBSTRATE MATERIAL WITHOUT FINES SHALL BE PLACED ON THE TOP 6" (MIN.) OF THE LOW FLOW CHANNEL.
- MATERIAL PLACEMENT AND EXTENTS SHALL BE CONSISTENT WITH THE DETAILS SHOWN ON SHEETS DT01-DT03.
- SEE DT02 FOR THE CHANNEL DIMENSION OF SOUTH PRONG CREEK.



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SOUTH PRONG STREAM RESTORATION PLAN

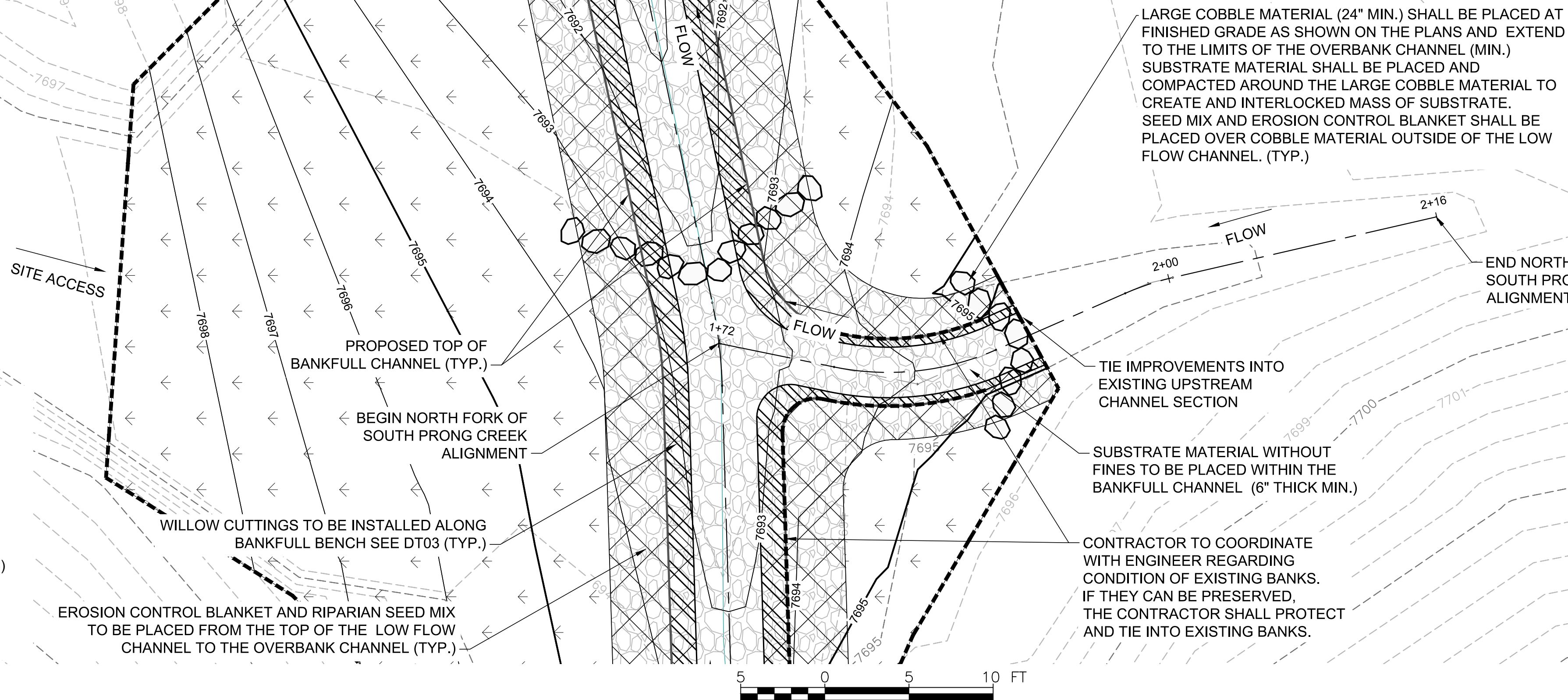
SOUTH PRONG CREEK PLAN & PROFILE

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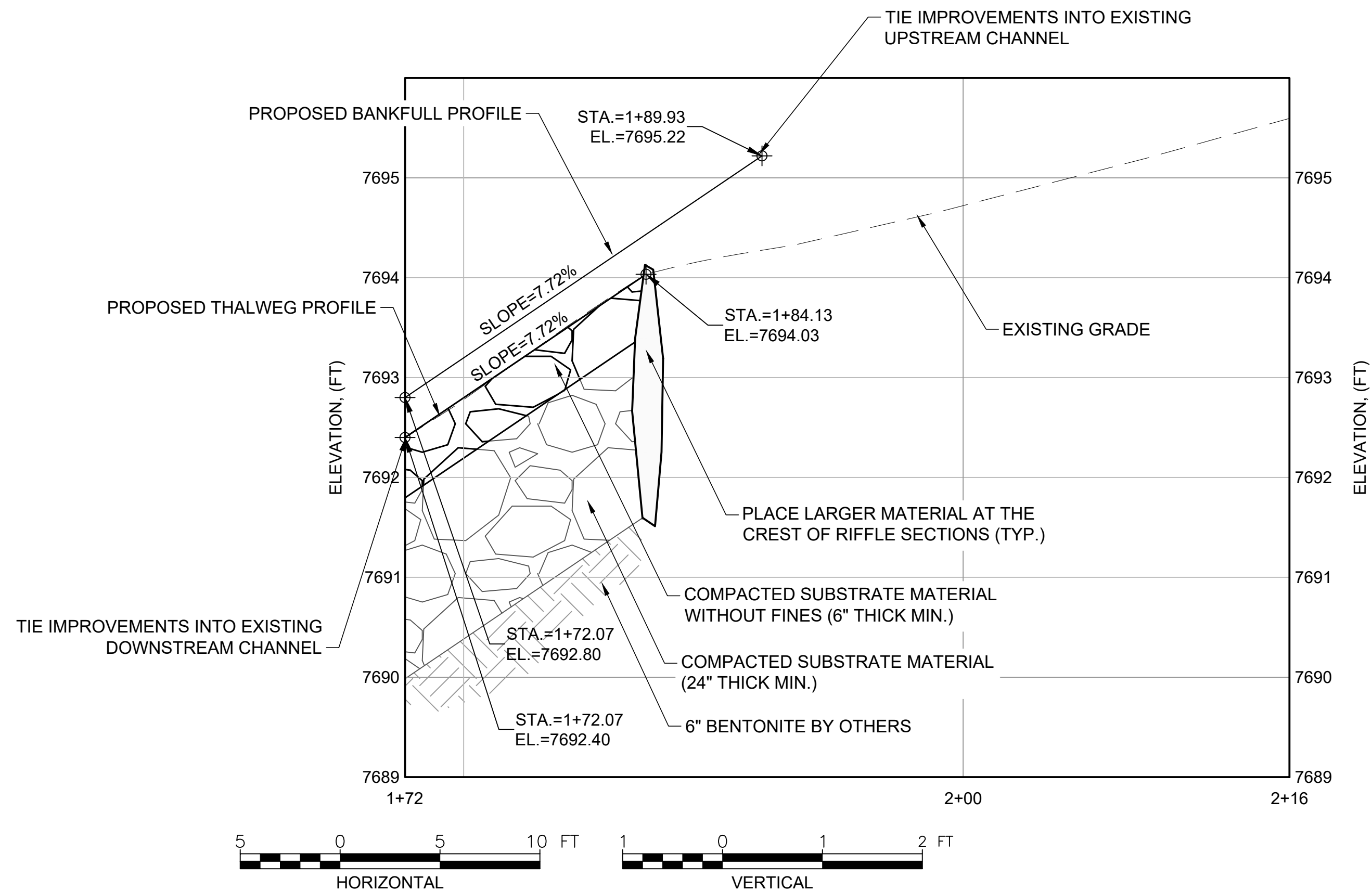
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- UPLAND REVEGETATION



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- SEE DT02 FOR THE CHANNEL DIMENSION OF THE NORTH FORK OF SOUTH PRONG CREEK.



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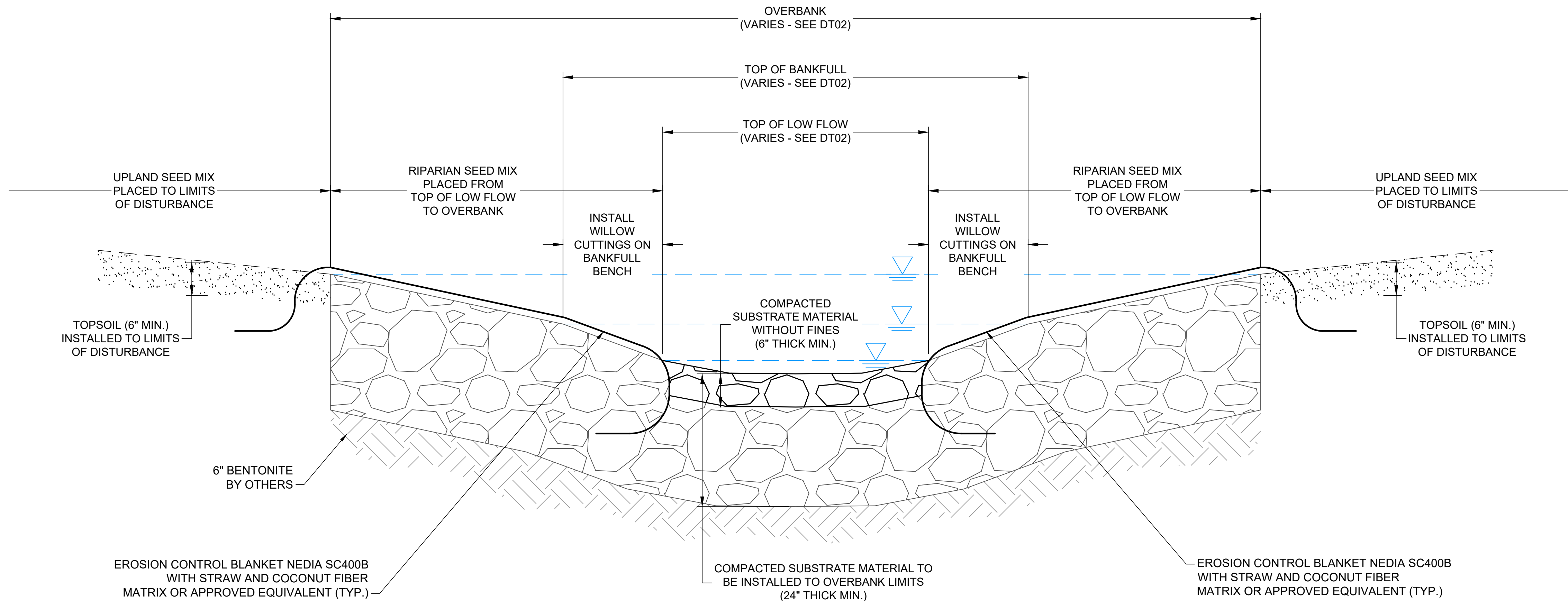
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SOUTH PRONG STREAM RESTORATION PLAN
NORTH FORK OF SOUTH PRONG CREEK PLAN & PROFILE

JOB NO.	831-032.921
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SHEET NO.	PP02



TYPICAL CHANNEL SECTION
NOT TO SCALE

TABLE 1. STREAM SUBSTRATE PROPORTIONS

Approximate Proportions (loader buckets)	Material Type	Material Description
6	Cobble	See Table 2.
1	Void-fill material	2 to 4-inch cobble (round washed river rock that is well-graded, 100% passing 6-inch sieve, 35-50% passing 3-inch sieve, 5-20% passing 2-inch sieve)
1	Void-fill material	4-inch minus pit run surge (round river rock and sand, well graded, 90-100% passing 4-inch sieve, 70-80% passing 1.5-inch sieve, 40-60% passing 3/8-inch sieve, 10-30% passing #16 sieve).
1	Void-fill material	Type II bedding
½ to 1	Void-fill material	Native topsoil
Top layer	Top dressing	Additional 4 to 12-inch cobbles (round washed river rock that is well graded, 80-100% passing 12-inch sieve, 35-50% passing 6-inch sieve, 5-20% passing 4-inch sieve) shall be mixed in on the surface of exposed sections of void-filled riprap (covering approximately 15% of the surface) prior to compaction of the void-filled riprap. Cobbles shall be fully embedded into the mass of the void-filled riprap.

Note: Mix proportions and material gradations are approximate and are subject to adjustment by the ENGINEER.

TABLE 2. COBBLE GRADATION

% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D ₅₀ * (INCHES)
70 - 100	15	9
50 - 70	12	
35 - 50	9	
2 - 10	3	

NOTE: MIX ON SITE AND PRIOR TO PLACEMENT

STREAM SUBSTRATE PLACEMENT AND GRADATION NOTES:

- WHERE STREAM SUBSTRATE IS DESIGNATED ON THE RESTORATION PLAN, COBBLE MATERIAL (WHICH MEETS THE GRADATION SHOWN IN TABLE 2) SHALL BE MIXED WITH SMALLER MATERIAL AND FINES TO MEET THE PROPORTIONS LISTED IN TABLE 1 TO FILL ALL REMAINING VOIDS.
- THE MIX PROPORTIONS PROVIDED IN THESE TABLE ARE APPROXIMATE AND ARE SUBJECT TO ADJUSTMENT BY THE ENGINEER. THE INTENT OF THE SPECIFIED STREAM SUBSTRATE MATERIAL IS TO MATCH THE EXISTING STREAM SUBSTRATE OF THE DOWNSTREAM CHANNEL.
- THE STREAM SUBSTRATE MATERIAL SHALL BE STOCKPILED AND THOROUGHLY MIXED PRIOR TO PLACEMENT AND SHALL BE INSTALLED AND COMPACTED SO THAT A DENSE, INTERLOCKED LAYER OF MATERIAL IS PROVIDED WITH VOIDS COMPLETELY FILLED. COMPACTION OF THE STREAM SUBSTRATE SHALL BE DONE USING HEAVY EQUIPMENT (E.G. BUCKET OF AN EXCAVATOR).
- WHERE INDICATED ON THE DRAWINGS, A SURFACE LAYER OF STREAM SUBSTRATE WITHOUT FINES SHALL BE PLACED AND COMPACTED, CONSISTENT WITH THE 'TOP-DRESS' MATERIAL INCLUDED IN TABLE 1.
- ALL STREAM SUBSTRATE SHALL BE COMPACTED AND REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY REVEGETATION.

STREAM SUBSTRATE GRADATION AND PLACEMENT NOTES

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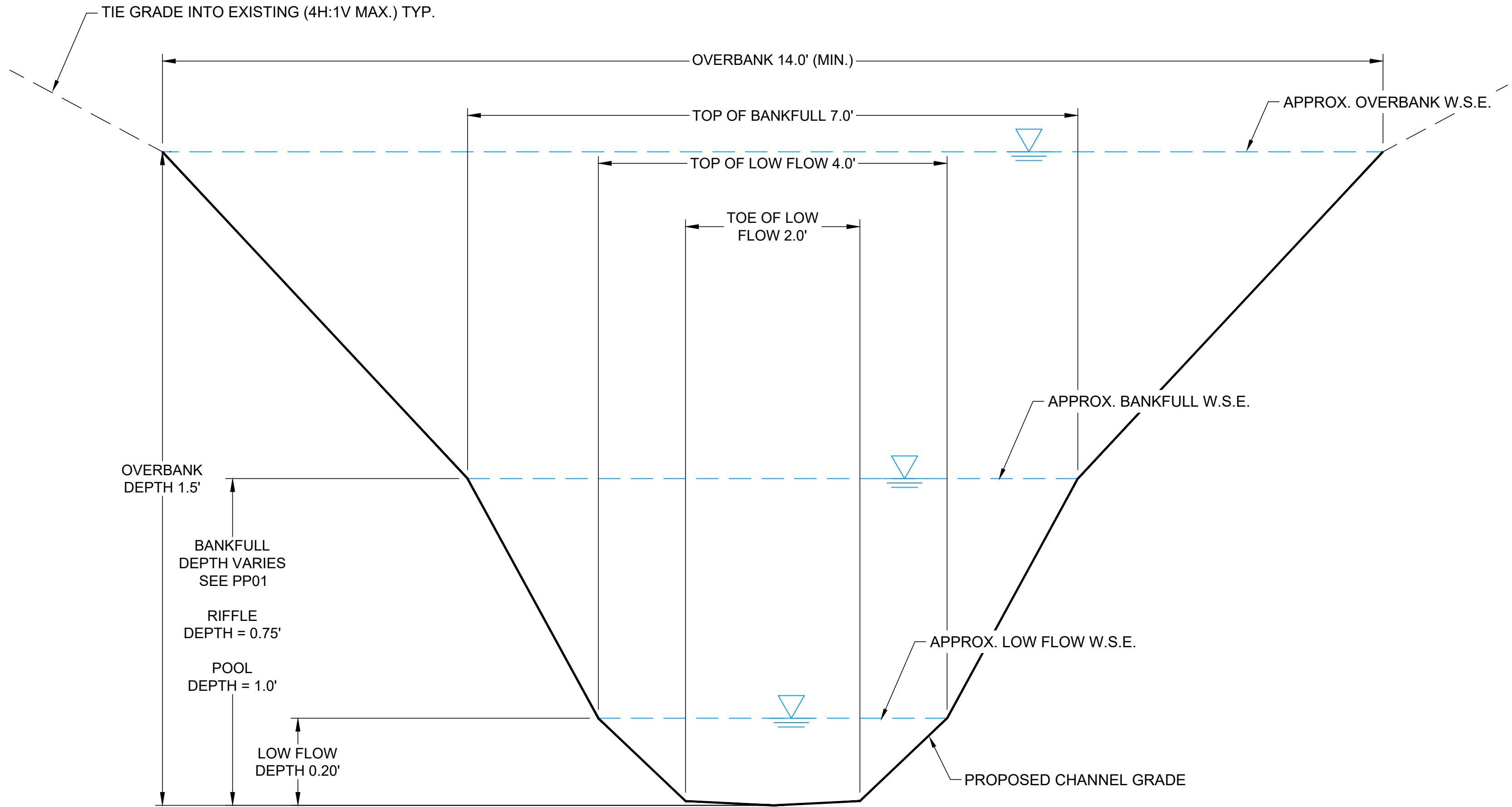
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SOUTH PRONG STREAM RESTORATION PLAN

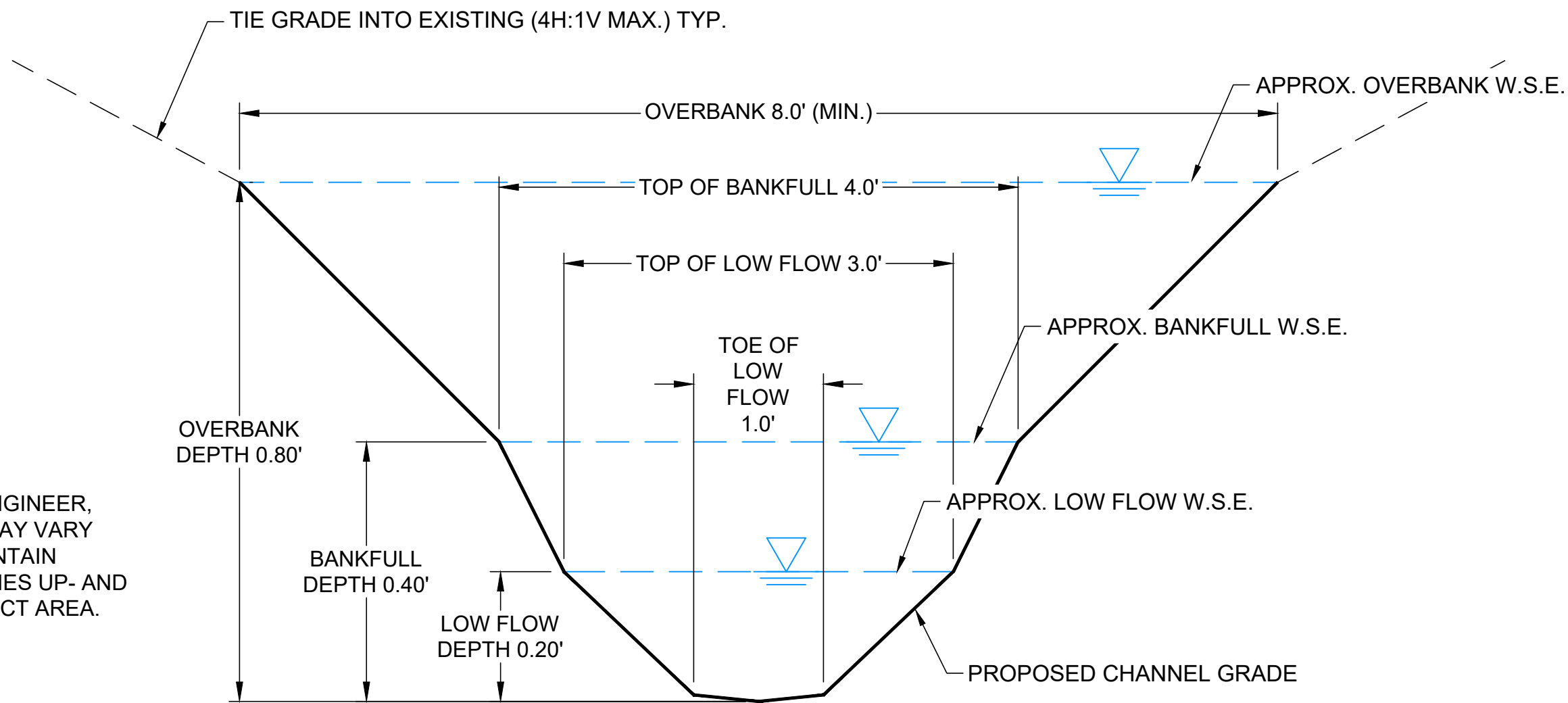
TYPICAL SECTION

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SOUTH PRONG CREEK TYPICAL CHANNEL SECTION

HORIZONTAL SCALE: 1" = 1'
VERTICAL SCALE: 1" = 0.2'

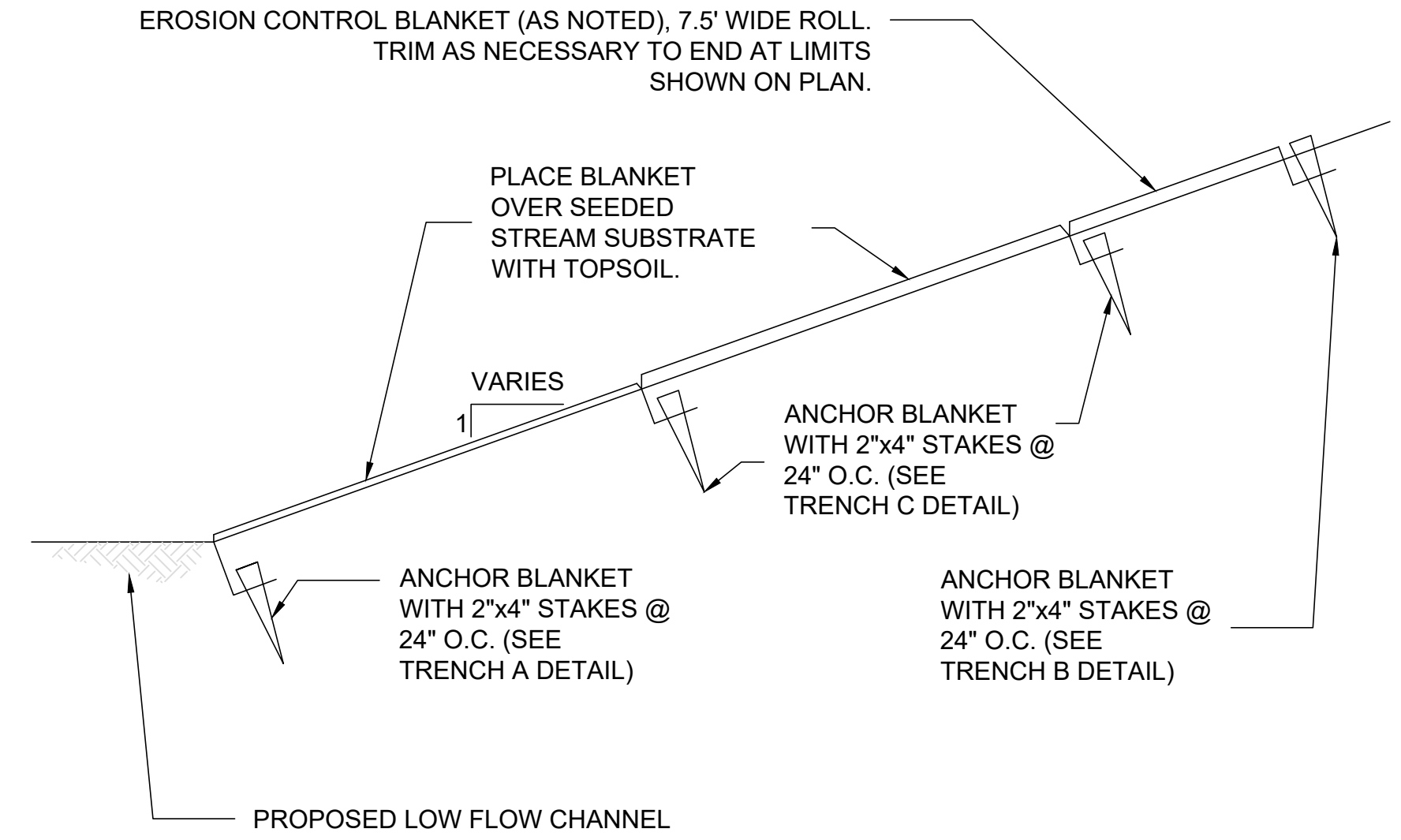


NORTH FORK OF SOUTH PRONG CREEK
TYPICAL CHANNEL SECTION

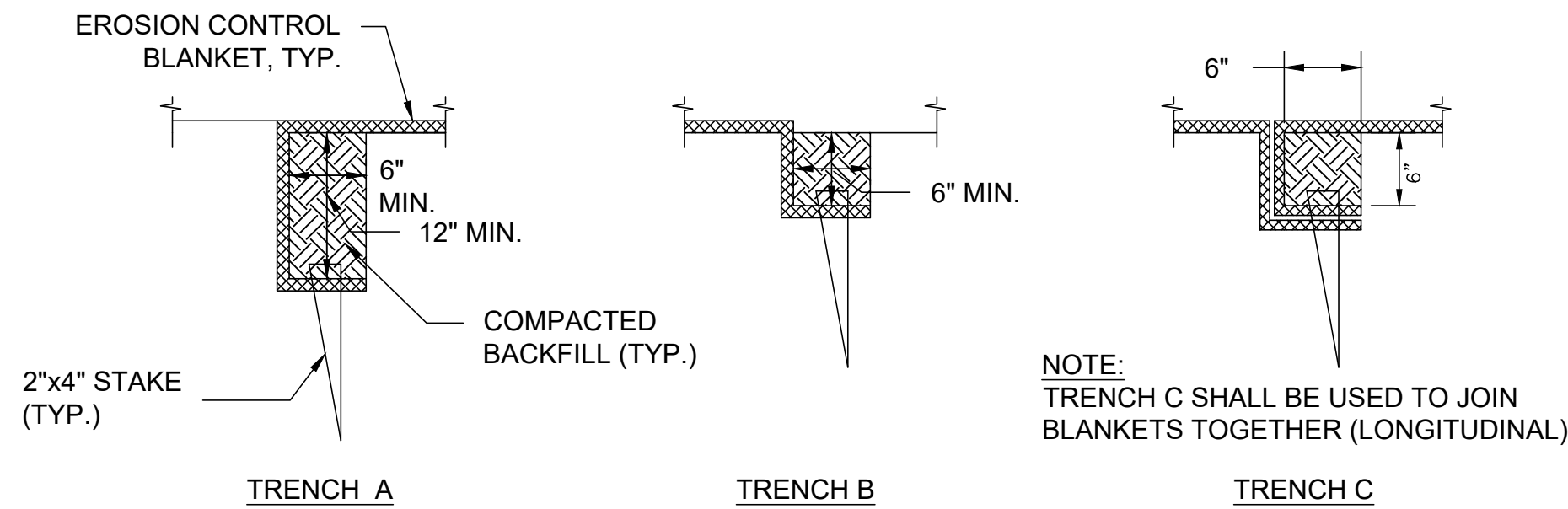
HORIZONTAL SCALE: 1" = 1'
VERTICAL SCALE: 1" = 0.2'

- CHANNEL DIMENSION NOTES:
- AT THE DIRECTION OF THE ENGINEER, THE CHANNEL DIMENSIONS MAY VARY FROM THOSE SHOWN TO MAINTAIN CONTINUITY WITH THE REACHES UP- AND DOWNSTREAM OF THE PROJECT AREA.

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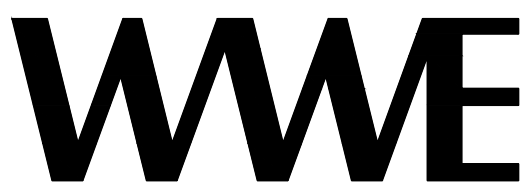
EROSION CONTROL BLANKET PLACEMENT DETAIL
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ANCHOR TRENCH FOR EROSION CONTROL BLANKET
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- EROSION CONTROL BLANKET NOTES:
- ALL DISTURBED AREAS TO BE REVEGETATED.
 - AREAS WITHIN THE OVERBANK CHANNEL SHALL BE REVEGETATED WITH A WETLAND OR RIPRARIAN SEED MIX. TRANSITIONAL AND UPLAND SEED MIXES SHALL BE APPLIED OUTSIDE OF BANKFULL CHANNEL. SEE DT03 FOR SEED MIXES.
 - NEDIA SC400B EROSION CONTROL BLANKET (OR APPROVED EQUAL) SHALL BE PLACED ATOP SEEDED TOPSOIL WITHIN THE OVERBANK CHANNEL, OUTSIDE OF THE LOW FLOW CHANNEL.
 - ALL AREAS OUTSIDE OF THE OVERBANK CHANNEL SHALL BE REVEGETATED TO THEIR NATIVE CONDITION

EROSION CONTROL BLANKET DETAILS



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SOUTH PRONG STREAM RESTORATION PLAN

SECTION DIMENSIONS

JOB NO.
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DT02

Table 39A Gunnison National Forest, Paonia Ranger District Seed Mix

Habitat type	Elevation	Species ^{1,2}	PLS #/Acre	% of Mixture
P/J Woodland	6-7,000	Galleta	3	16
		Western wheatgrass	4	20
		Great Basin Wildrye	3	16
		Indian Ricegrass	3	16
		Sandberg bluegrass	3	16
		Bottlebrush squirreltail	3	16
		Total	19	100

Habitat type	Elevation	Species ^{1,2}	PLS #/Acre	% of Mixture
Mountain Shrub	7-8,000	Mountain Bromegrass	4	20
		Prairie Junegrass	3	15
		Western wheatgrass	4	20
		Indian Ricegrass	3	15
		Sandberg bluegrass	3	15
		Bluebunch wheatgrass	3	15
		Total	20	100

Habitat type	Elevation	Species ^{1,2}	PLS #/Acre	% of Mixture
Aspen/Spruce-Fir	8-9,500	Mountain Bromegrass	5	26
		Slender Wheatgrass	3	16
		Thickspike Wheatgrass	3	16
		Canby Bluegrass	3	16
		Blue Wildrye	5	26
			Total	19

Temporary Revegetation	Elevation	Species	PLS #/Acre
Regreen (brand name)	All	Tall wheatgrass/winter wheatgrass	20
Pioneer (brand name)	All	Triticale/winter wheat	20

1 - The above grass species may vary slightly dependent on the particular field site. The mixes will be customized per location to optimize reclamation success.

2 - The above seed mixes will also include a mix of native forbs from the following list: *Coreopsis lanceolata*, *Lupinus argenteus*, *Phlox drummondii*, *Thermopsis Montana*, *Penstemon strictus*, *Vicia americana*, *Achillea millefolium* var. *occidentalis* (at a very low rate), *Aster chilensis*, *Erigeron speciosus*, *Eriogonum umbellatum* or *Geranium viscosissimum*. The precise forbs to be included will be prescribed on a case-by-case basis, as the particular site conditions dictate. At least 3 forb species will be included in each mix. The seed mix must contain enough pure live seed to have a reasonable prospect of success, and contain less than 1% weed seeds, none of which may be noxious.

Grass and Forb Species	PLS #/Acre	% of Mixture
Western Wheatgrass	4	36
Kentucky Bluegrass	1/2	5
Slender Wheatgrass	2	18
Streambank Wheatgrass	3	27
Alsike Clover	1/2	5
Cicer Milkvetch	1	9
Total	11	100

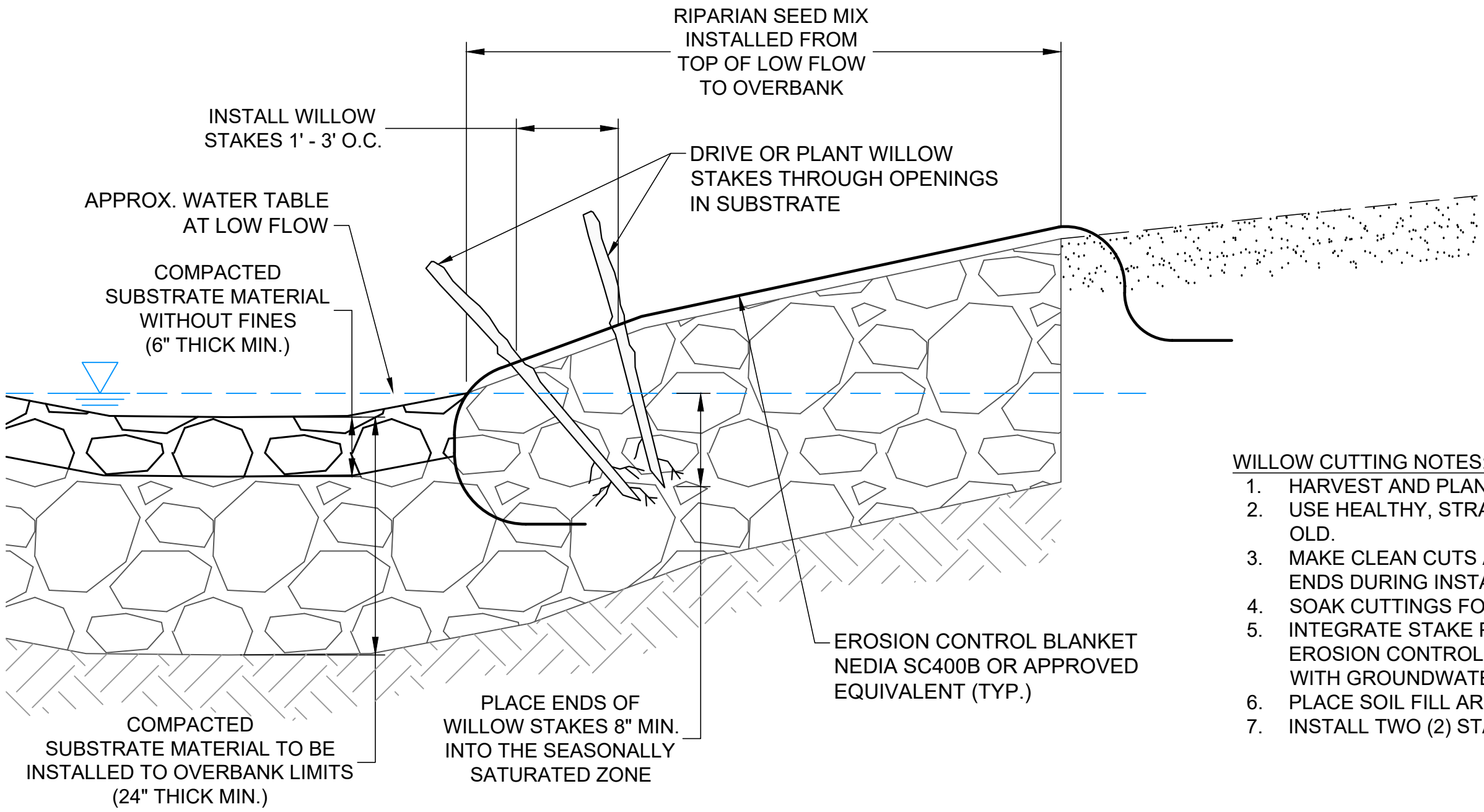
PLS = PURE LIVE SEED

Shrub Species	Stems #/Acre
Streambank Willow	250
Blue Spruce	-

UPLAND SEED MIX

RIPARIAN SEED MIX

RIPARIAN AND UPLAND PLANTING SCHEDULE



- WILLOW CUTTING NOTES:
1. HARVEST AND PLANT CUTTINGS DURING THE DORMANT SEASON.
 2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST ONE YEAR OLD.
 3. MAKE CLEAN CUTS AND DO NOT DAMAGE CUTTINGS OR SPLIT ENDS DURING INSTALLATION.
 4. SOAK CUTTINGS FOR 5-7 DAYS PRIOR TO INSTALLATION.
 5. INTEGRATE STAKE PLANTING WITH SUBSTRATE MATERIAL AND EROSION CONTROL BLANKET PLACEMENT TO ENSURE CONTACT WITH GROUNDWATER TABLE.
 6. PLACE SOIL FILL AROUND CUTTINGS AND 'WATER IN'
 7. INSTALL TWO (2) STAKES PER LINEAR FOOT OF COBBLE TOE.

WILLOW CUTTINGS
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811
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CENTER OF COLORADO
1-800-922-1987
CALL 3-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES



WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

NO.	BY	DATE	DESCRIPTION	COMMENTS
1				
2				
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7				
8				
9				
10				

DESIGN	DTL	DATE
DETAIL	DTL	10/28/20
CHECK	SDS	10/28/20
APPROVAL		
SCALE		SHOWN
DT.dwg		

SOUTH PRONG STREAM RESTORATION PLAN

REVEGETATION DETAILS

JOB NO.
831-032.921
REVISION NO.

SHEET NO.
DT03